

## GENERAL NOTES

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### IMMATURE STAGES OF *SAIS ROSALIA* (NYMPHALIDAE, ITHOMIINAE)

**Additional key words:** life-history, Mechanitini, Solanaceae.

The immature stages of butterflies in the subfamily Ithomiinae (Nymphalidae) are relatively well known for most genera, with good descriptions available in the literature (DeVries 1987, Brown & Freitas 1994 and references therein). However, information is scarce or absent for many small genera (such as *Roswellia*, *Eutresis*, *Athyrtis*, *Paititia*, *Aremfoxia*, *Veladyris*, *Velamysta*, *Dygoris*, and *Hypomenitis*), and still incomplete for most larger diversified genera (*Hyaliris*, *Hypothyris*, *Napeogenes*, *Hyposcada*, *Oleria*, *Ithomia*, *Pteronymia*, *Greta*, *Hypoleria*). In the tribe Mechanitini, there is adequate information for most species and all genera (Brown & Freitas 1994), except *Forbestra* (larva briefly described in Drummond 1976) and *Sais* (minimal information on the egg and larva in Table 1 and Fig. 2 of Brown & Freitas 1994, from rearing in Goiânia, Goiás, Brazil, in 1968). In this paper, all immature stages of *Sais rosalia* (Cramer, 1779) are described and illustrated.

*Sais rosalia* (near subspecies *rosalinde* Weymer, 1890 = *paraensis* Haensch, 1905, see Lamas 1994) was studied on banks and islands of the Teles Pires River, north of Alta Floresta, state of Mato Grosso, Brazil, in February and June 2000. On the latter visit, many eggs and larvae were collected on a solanaceous vine, probably of the genus *Lycianthes* (very similar to the host recorded in Goiânia; a live plant has been kept to await flowering). Additional eggs ( $n = 19$ ) were also obtained from a wild caught female kept in a plastic bag with the host plant. The larvae were kept with leaves of the host plant in plastic boxes that were cleaned daily. Egg size was measured as height and width; and the larval head capsule size as the distance between the most external ocelli (as in Freitas 1991, 1993); all capsules were retained for confirmation of growth stages. Adults, preserved larvae, capsules, and pupal skins are in the collection of the first author.

About 20 eggs and four first instars were collected in the field on several food plant individuals growing near the riverbanks in sunny places. The plants varied from 50 cm to 2 m high, and had small soft leaves. The isolated eggs and larvae were found on the underside of mature leaves. Females were observed ovipositing in the late afternoon, from 1500 to 1800 h. After inspecting the plant, the female landed on the upper side of a mature leaf and curved the abdomen to lay an isolated egg on the underside. After hatching, caterpillars ate part of the eggshell, and later began to eat the leaves,

chewing small holes in the blade. Although solitary, larvae were not cannibalistic; several instars could be reared together without losses. The caterpillars rested in a J-shaped position on the underside of the leaves. When disturbed, caterpillars dropped off the leaf, suspending themselves by silk threads.

**Egg** (Fig. 1a). White, elongated, slightly pointed at the apex, with 15–18 longitudinal ridges and 9–12 transverse ridges (similar to that described in Brown & Freitas 1994). Duration 3–4 days.

**Larvae. First instar.** White, turning green after first meal; legs, prolegs and anal plate black. Head black; average width 0.48 mm (SD = 0.03,  $n = 11$ ). In dorsal view, the lateral tubercles (present in all instars) could be observed easily as small rounded projections on each abdominal segment. Maximum length 4 mm. Duration 2–3 days. **Second and third instars.** Dark green to leaden gray, with a white collar on the prothorax and a lateral series of short yellow tubercles along the abdomen; legs, prolegs and anal plate pale. Head black; average width (second instar) 0.75 mm (SD = 0.03,  $n = 12$ ), (third) 1.19 mm (SD = 0.04,  $n = 12$ ). Maximum length 8 mm (second) or 13 mm (third instar). Duration 3 days (second) or 8–9 days (third). **Fourth (final) instar** (Fig. 1b, c). Dorsum dark gray, ventral region pale gray, with a white collar on the prothorax and a lateral series of short yellow tubercles (tubercles on A1, A2, A7 and A8 more developed); legs and prolegs dark. Head black or rarely brown; average width 1.74 mm (SD = 0.04,  $n = 10$ ). Maximum length 25 mm. Duration 5–6 days. The pre-pupa loses the contrasting color-pattern and becomes reddish, adopting an arched configuration (Fig. 1d).

**Pupa** (Fig. 1e–g). Elongated, slightly arched ventrally (about 60°) between the second and third abdominal segments, beige with a general gold reflection and black stripes on the wing cases (rarely dark with reduced reflective areas); cremaster red. Ocular caps short and pointed. Length 15 mm. Duration 13 days ( $n = 12$ ).

The immature stages of *Sais rosalia* are similar to those of other Mechanitini, including egg shape and size, number of longitudinal and transverse ridges, a lateral series of tubercles on the abdominal segments of the larvae, and the pupa elongated, slightly arched and reflective (Motta 1989, Brown & Freitas 1994). Contrary to *Mechanitis*, which has long pointed lateral tubercles, the larva of *Sais* bears short lateral tubercles, a feature shared with *Thyridia*, *Forbestra* and *Scada* (Brown & Freitas 1994). Perhaps the most interesting feature in the life history of the studied population of *Sais rosalia* is that there were only four larval stadia. All known ithomiine larvae have at least five instars (six instars were observed once in *Placidina*, AVLFP pers. obs.), with the exception of *Tellervo zoilus* (Fabricius, 1775), also with four instars (Ackery 1987:272, with A. G. Orr); this Australian species has been placed in a separate subfamily by some authors (Ackery 1987).

Only four instars were also observed in 12 larvae of *Sais rosalia brasiliensis* (reared to pupae on the Teles

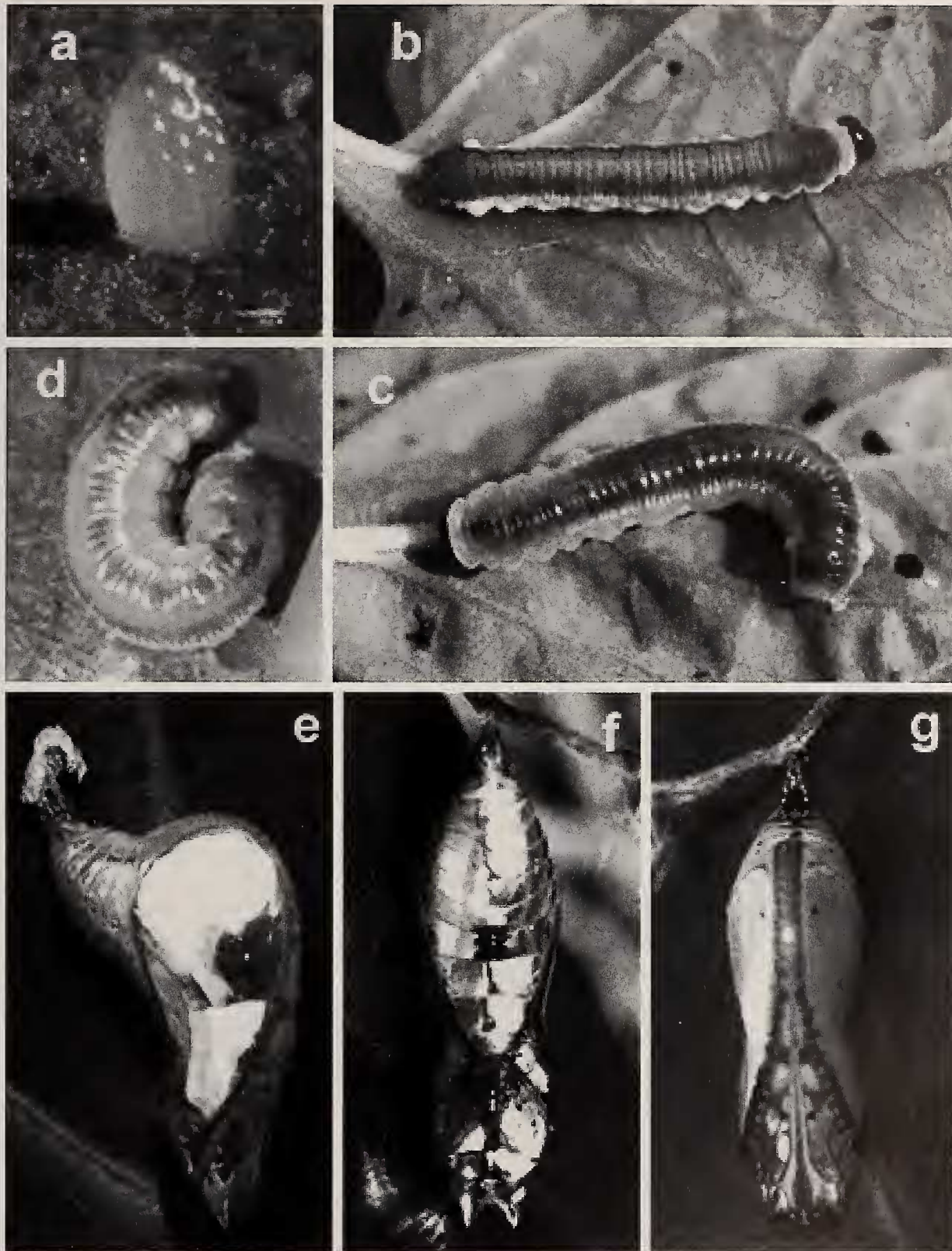


FIG. 1. Immature stages of *Sais rosalia*; a, egg; b, c, fourth (final) instar; d, pre-pupa; e–g, pupa (e, lateral; f, dorsal; g, ventral).

Pires plant) from 17 eggs of a single female captured on 28 November 2001 in the broad floodable gallery forests of the Rio do Peixe (21°36'S, 51°42'W, 1400 km south of the Teles Pires site, near Presidente Epitácio in extreme western São Paulo State). The recovered head capsules from larvae reared in 2001 show four widely separate width ranges: (1) 0.48–0.51

mm (N = 7), (2) 0.74–0.77 mm (N = 5), (3) 1.15–1.24 mm (N = 10), and (4) 1.72–1.96 mm (N = 8). All other aspects of larval coloration, instar duration, morphology and behavior were identical to the Teles Pires population.

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#### MATINGS WITHOUT SPERMATOPHORE TRANSFER AND WITH TRANSFER OF TWO SPERMATOPHORES IN *CALLOPHRYS XAMI* (LYCAENIDAE)

**Additional key words:** spermatophore production, copulation, sexual selection.

In Lepidoptera, males normally transfer one spermatophore during copulation (Drummond 1984). However, some studies indicate that in some matings no spermatophore is transferred (although this does not necessarily mean that the female is not inseminated; Drummond 1984). There are several possible explanations for this fact: (a) exhaustion of substances necessary for building spermatophores as a result of frequent mating (Drummond 1984); (b) male or female disabilities, such as deformations in the genitalia or in the reproductive tract resulting from disease or defective development; or (c) mate choice (rejection) after initiation of copulation by females (i.e., females somehow inhibit or prevent the transfer of spermatophores by certain males; Eberhard 1996) or by males (i.e., males avoid to transfer spermatophores to certain females). Mate rejection could be achieved by interrupting copulations before successful spermatophore transfer; in this case copulations are expected to be of short duration (Cordero 1993).

On the other hand, it has been found that sometimes males transfer more than one spermatophore in one copulation (Drummond 1984). This type of mating may be a male adaptation to sperm competition if the transfer of multiple spermatophores decreases female recep-

tivity during a longer period (in several species there is a negative correlation between female receptivity and the degree of distention of the corpus bursa) (Drummond 1984) or if permits the transfer of more sperm (for example, if spermatophores can contain only a certain maximum amount of sperm). However, the transfer of multiple spermatophores may be disadvantageous for many species, since the last spermatophore needs to be at least partially digested before re-mating because sperm migration to the spermatheca requires proper alignment of the spermatophore tube with the ductus seminalis and this alignment is more difficult in the presence of another spermatophore (Drummond 1984, Simmons & Siva-Jothy 1998). Thus, an alternative hypothesis is that the transfer of more than one spermatophore in one copulation is result of a male disability.

The multiplicity of explanations, and the theoretical relevance of many of them, indicates that to report matings in which no spermatophore is transferred and in which multiple spermatophores are transferred, as well as its possible causes, is important. During the course of three laboratory experiments on spermatophore production by males of the lycaenid butterfly *Callophrys xami* (Reakirt) (Cordero 1998), in which I observed 199